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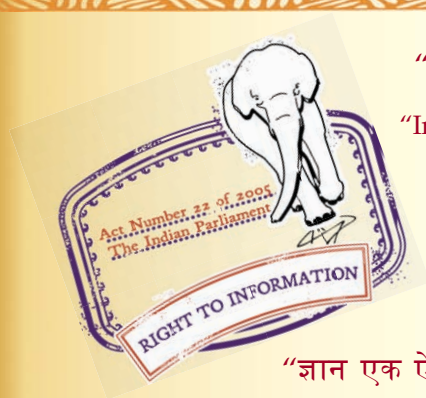
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IS 6235 (1992): Dimensions of pot-cores made of magnetic oxides and associated parts [LITD 5: Semiconductor and Other Electronic Components and Devices]



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भारतीय मानक
चुम्बकीय आक्साइड एवं सम्बद्ध पुर्जों
के घट कोड प्रणाली के आयाम
(पहला पुनरीक्षण)

Indian Standard

DIMENSIONS OF POT-CORES MADE OF
MAGNETIC OXIDES AND
ASSOCIATED PARTS

(*First Revision*)

UDC 621.318.1.042.1 : 006.78

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BUREAU OF INDIAN STANDARDS
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NEW DELHI 110002

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Price Group 5

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Magnetic Components and Ferrite Materials Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

This standard was originally published in 1971. This revision has been undertaken to take into account the latest technical developments and experience gained through the implementation of the standard since its first publication. While revising the standard, the effective parameter values for pot cores have been included.

While preparing this revised standard, assistance has been derived from IEC Pub 133 (1985) 'Dimensions of pot-cores made of magnetic oxides and associated parts', issued by the International Electrotechnical Commission (IEC).

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

DIMENSIONS OF POT-CORES MADE OF MAGNETIC OXIDES AND ASSOCIATED PARTS

(First Revision)

1 SCOPE

1.1 This standard specifies the important dimensions for a preferred range of pot-cores made of magnetic oxides to ensure mechanical interchangeability and the dimensional limits for unwound and wound coil formers to be used with them.

2 REFERENCE

2.1 The Indian Standard listed below is necessary adjunct to this standard:

IS No.	Title
7616 : 1974	Guide for calculation of the effective parameters of magnetic piece parts

3 PRIMARY STANDARDS

3.0 Compliance with the following requirements ensures mechanical interchangeability of complete assemblies and wound coil formers. The general consideration upon which the design of this range of cores is based is given in Annex A.

3.1 Dimensions of Pot-Cores

3.1.1 Principal Dimensions

The principal dimensions of pot-cores shall be as given in Table 1 and Table 2 read with Fig. 1.

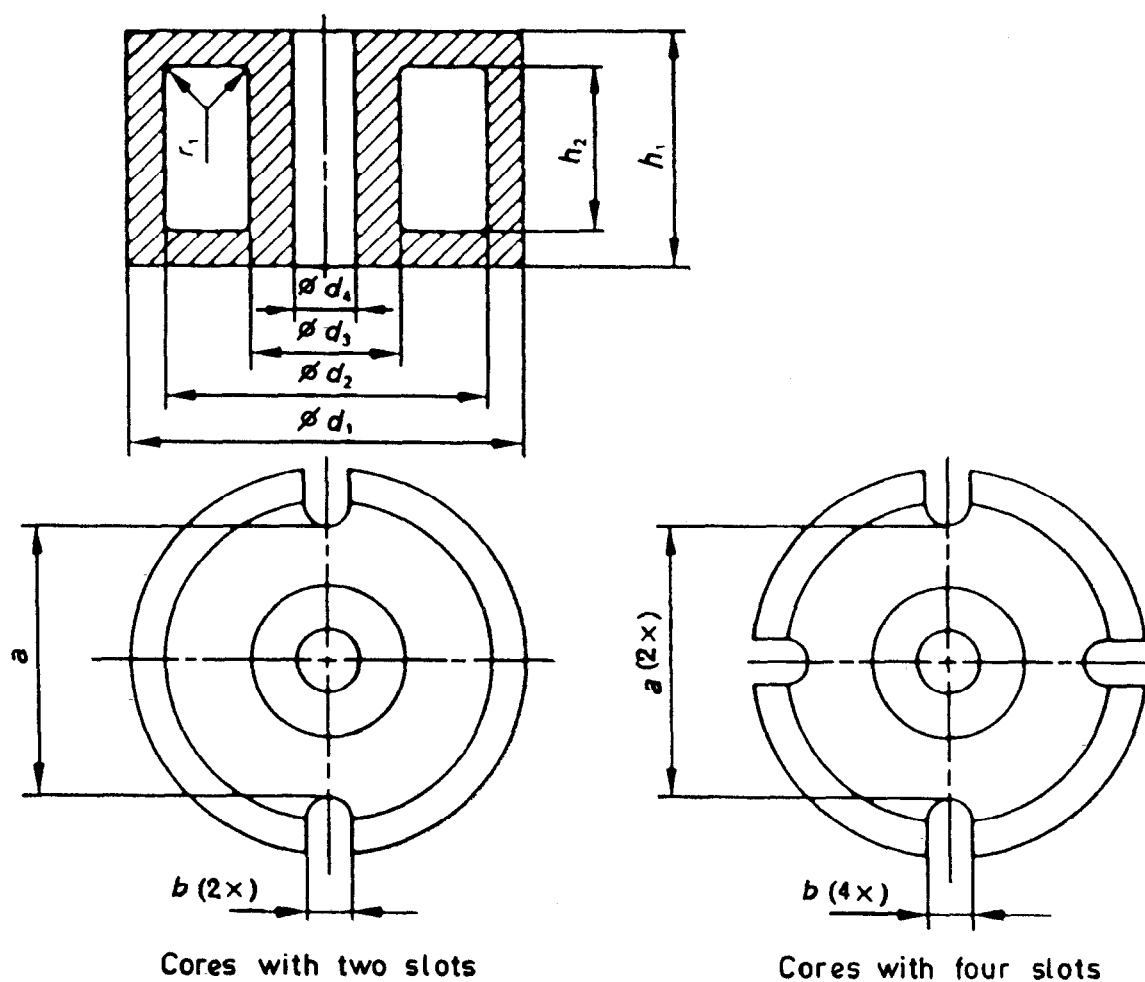


FIG. 1 PRINCIPAL DIMENSIONS OF POT-CORES

Table 1 Principal Dimensions Excluding Limits for a and b
(Clause 3.1.1)

All dimensions in millimetres.

Size	ϕd_1		ϕd_2		ϕd_3		ϕd_4^*		h_1^+		h_2		$b^\dagger$	$r_1^\S$
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
9 × 5	9	9.3	7.5	7.75	3.7	3.9	2	2.2	5.1	5.4	3.6	3.9	1.6	0.25
11 × 7	10.9	11.3	9	9.4	4.5	4.7	2	2.2	6.3	6.6	4.4	4.7	1.6	0.25
14 × 8	13.8	14.3	11.6	12	5.8	6	3	3.2	8.2	8.5	5.6	6	2	0.25
18 × 11	17.6	18.4	14.9	15.4	7.3	7.6	3	3.2	10.4	10.7	7.2	7.6	2	0.25
22 × 13	21.2	22	17.9	18.5	9.1	9.4	4.4	4.7	13.2	13.6	9.2	9.6	2.5	0.35
26 × 16	25	26	21.2	22	11.1	11.5	5.4	5.7	15.9	16.3	11	11.4	2.5	0.35
30 × 19	29.5	30.5	25	25.8	13.1	13.5	5.4	5.7	18.6	19	13	13.4	3	0.35
36 × 22	35	36.2	29.9	30.9	15.6	16.2	5.4	5.7	21.4	22	14.6	15	3.5	0.35
42 × 29	41.7	43.7	35.6	37	17.1	17.7	5.4	5.7	29.3	29.9	20.3	20.7	4	0.4

*Pot-cores without a centre hole ($\phi d_4 = 0$) are not excluded. When closer tolerance on the centre hole diameter ϕd_4 is required, it should be obtained by reducing the maximum limit as follows:

9 × 5 and 11 × 7	2.1 mm
14 × 8 and 18 × 11	3.1 mm
22 × 13	4.6 mm
26 × 16, 30 × 19, 36 × 22 and 42 × 29	5.6 mm

†When closer tolerance on the height is required for pot-cores 9 × 5 and 11 × 7, the maximum limit should be retained.

‡Sharp inner corners of pot-cores are preferable but in practice some rounding may occur, provided that radius r_1 is not exceeded.

§The shape of the slot is not defined, but the smallest width is indicated in the table. Slots in the slide wall should normally pass through the bottom of the pot-core over at least the full width of the outer wall for at least two of the slots, except for size 42 × 29.

Table 2 Limits for a and b
(Clause 3.1.1)

All dimensions in millimetres.

Size	Cores with Two Slots*				Cores with Four Slots*			
	a		b		a		b	
	Min	Max	Min	Max	Min	Max	Min	Max
9 × 5	6.0	7.5	1.6	2.4				
11 × 7	6.5	8.0	1.8	2.6				
14 × 8	8.7	10.4	2.3	4.1	8.7	10.4	1.6	2.0
18 × 11	11.3	14.0	2.7	4.4	11.3	13.4	2.2	3.0
22 × 13	13.3	16.5	3.0	4.4	13.3	16.0	2.5	3.5
26 × 16	17.0	20.0	3.0	4.4	17.0	19.4	2.7	3.5
30 × 19	20.0	23.0	3.5	5.3	20.0	22.5	3.1	4.0
36 × 22	24.0	27.2	4.0	5.6	24.0	26.8	3.6	4.5
42 × 29	30.0	33.2	4.0	5.8				

NOTE — The dimensions of the cores may be checked by means of gauges. By way of example, a possible standard for these gauges is given in Annex C. In order to facilitate production it may be necessary to use gauges having dimensions differing from those given in Annex C, although no relaxation of the requirements for the dimensions of the cores given in 3.1 is permitted.

* The shape of the slots is not defined; but the smallest width is indicated in the table. Slots in the side wall should normally pass through the bottom of the pot-core over at least the full width of the outer wall for at least two of the slots, except for size 42 × 29.

It is recommended that any tightening of the tolerance on dimension a should be towards the minimum value and on dimension b towards the maximum value.

3.1.2 Grooves

When grooves are provided in the bottom corresponding to the slots, their minimum depth shall be as given in Table 3.

Table 3 Minimum Groove Depth

Size	Minimum Groove Depth (mm)
14 × 8	0.2
18 × 11	0.3
22 × 13	0.4
26 × 16	0.5
30 × 19	0.6
36 × 22	
42 × 29	

3.1.3 Effective Parameter Values

The effective parameter values for pot-cores whose dimensions comply with 3.1.1 shall be as given in Table 4 (for the definitions of these parameters and their calculation, see IS 7616 : 1974).

3.2 Dimensional Limits for Coil-Formers

3.2.1 Unwound Coil-Formers

Before winding, the flange width F and the height of the copper space H_3 , measured half way between the end flanges, shall be not less than the values specified in Table 5 read along with Fig. 2.

NOTES

1 The dimensions of Table 5 which correspond to similar dimensions in Table 1 are labelled with the same letter, but in upper case, for example H_2 and h_2 there is thus no H_1 in Table 5.

2 The taper of flanges on the inside is approximately 0.1 mm over the flange width. Any partitioning walls have about the same thickness and taper as the flanges.

3.2.2 Wound Coil-Formers

After winding in accordance with the manufacturer's specification, the coil-former shall be within the outline dimensions shown in Table 5.

NOTES

1 When designing a coil-former which is to meet the requirements for the outline after winding, allowance should be made for the deformation during winding, the thermal expansion during normal operation and surface irregularities such as burrs and fins resulting from the manufacturing process.

The dimensions should be chosen so that, depending upon the material to be used, the outline will not be exceeded when the winding is done in a manner appropriate to the application.

2 The following is a suggested winding method which may be used to check compliance with the requirement:

The coil-former is placed on a mandrel with a diameter equal to $\phi d_{\text{Max}} + 0.08 \pm 0.005$ mm and is clamped between two rigid flat disks. The former is fully wound with solid copper wire of 0.2 mm diameter applying a winding stress of 1.6 N. The coil-former is taken from the mandrel and measured.

4 DERIVED STANDARDS

4.0 The use of derived standards which give a more detailed specification of component parts whilst still permitting compliance with this standard is discussed in Annex B which also contains an example of a derived standard for coil formers.

Table 4 Effective Parameter Values
(Clause 3.1.3)

Size	C_1 (mm ⁻¹)	C_2 (mm ⁻³)	A_e (mm ²)	L_e (mm)	V_e (mm ³)
9 × 5	1.25	0.125	10.0	12.5	125
11 × 7	1.00	0.063	15.9	15.9	252
14 × 8	0.80	0.032 0	25.0	20.0	500
18 × 11	0.60	0.013 9	43	25.9	1 120
22 × 13	0.50	0.007 9	63	31.6	2 000
26 × 16	0.40	0.004 3	93	37.2	3 460
30 × 19	0.330	0.002 43	136	45	6 100
36 × 22	0.260	0.001 29	202	52	10 600
42 × 29	0.260	0.000 98	265	69	18 300

NOTES

1 The above values refer to pot-cores with a centre hole.

2 The manufacturers may indicate in their catalogues more precise values than those given in the above table.

* ϕd_3 is the centre boss diameter of the core (see Table 1).

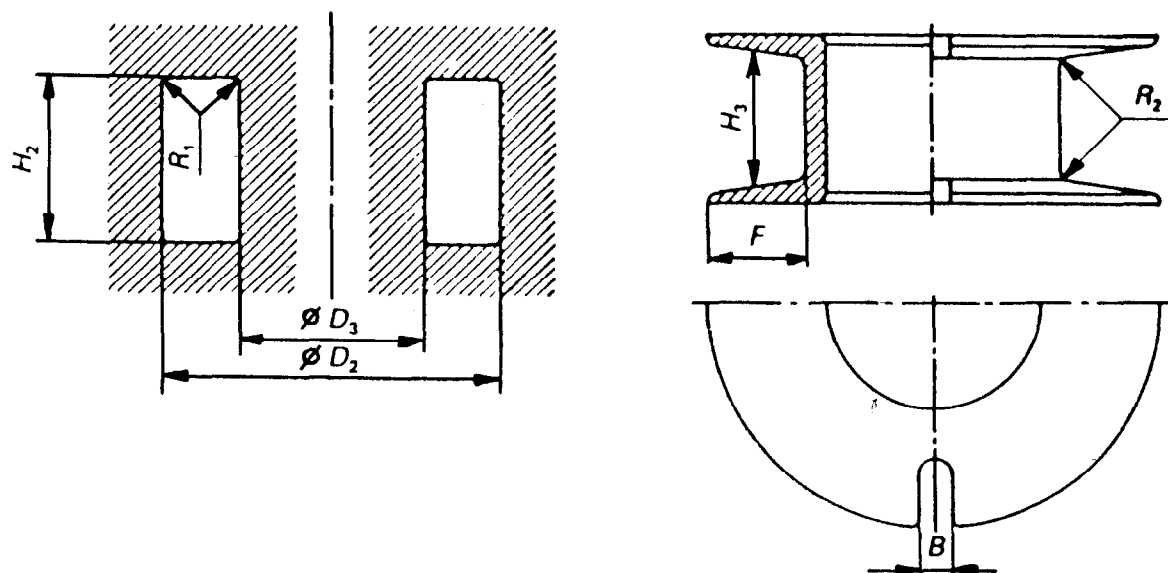


FIG. 2 COIL-FORMERS

Table 5 Dimensional Limits for Coil-Formers

(Clauses 3.2.1 and 3.2.2)

All dimensions in millimetres.

Size	Outline of Wound Coil-Former*			Unwound Coil-Former		R_1 Min †	R_2 Max	B ‡ Min
	ϕD_2 Max	ϕD_3 Min	H_2 § Max	F Min	H_3 Min			
9 × 5	7.4	4	3.6	1.22	2.6	0.25	0.5	1.6
11 × 7	8.9	4.8	4.4	1.45	3.3	0.25	0.5	1.6
14 × 8	11.5	6.1	5.6	2.05	4.3	0.25	0.5	1.6
18 × 11	14.8	7.7	7.2	2.9	5.9	0.25	0.5	1.8
22 × 13	17.8	9.5	9.2	3.4	7.7	0.35	0.5	1.8
26 × 16	21.1	11.6	11	3.95	9.5	0.35	0.5	1.8
30 × 19	24.9	13.6	13	4.75	11.3	0.35	0.5	1.8
36 × 22	29.8	16.3	14.6	5.66	12.6	0.35	0.5	2.8
42 × 29	35.5	17.8	20.3	7.75	17.6	0.4	0.5	2.8

*These dimensions define the outline of the wound coil-former. The dimensions of the unwound coil-former will depend on the material and the method of winding specified.

†The minimum radius R_1 only applies for the inner corner if the minimum clearance in height between this outline and the minimum pot-core outline (h_2 of Table 1) is less than 0.1 mm as is the case in this standard.

‡The shape of the slot is not defined, but its smallest width is indicated in the table.

§ H_2 for core size 42 × 29 may be chosen somewhat smaller when the application is for a loading coil.

ANNEX A

(Clause 3.0)

POT-CORE DESIGN

A-1 The pot-cores covered by this standard were originally designed for optimum dimensions based upon minimum loss R_{dc}/L . Before optimizing for performance, the following hole diameter ranges were chosen:

- 3.0 mm to 3.2 mm for small pot-cores,
- 4.4 mm to 4.7 mm for medium pot-cores, and
- 5.4 mm to 5.7 mm for large pot-cores.

Originally a pot-core 14 mm × 8 mm, with an adjusting device of 3 mm diameter was the smallest that could be produced in quantity.

Subsequently it became possible to mass produce cores as small as 9 mm × 5 mm with 2 mm diameter adjusters, and a hole size range of 2.0 mm was adopted for this pot-core and the 11 mm × 7 mm size. The above limits have been exceeded industrially, with pot-cores of 7 mm × 4 mm (having a hole of 1.5 mm) and smaller appearing in manufacturers' but these miniature pot-cores have not yet been the subject of national standardization.

The ratio of diameter to height of the pot-core, calculated on the above assumptions, is fairly constant, as

appears from Table 6 and $\phi d_1/h_1$ lies between 1.58 and 1.75, except for the largest type. The somewhat higher values for the smaller pot-cores are because of the relatively great influence of the hole diameter.

Table 6 Diameter to Height Ratio

Size	ϕd (nom)	h_1 (nom)	$\phi d_1/h_1$
9 × 5	9.2	5.25	1.75
11 × 7	11.1	6.5	1.71
14 × 8	14.05	8.35	1.68
18 × 11	18	10.55	1.71
22 × 13	21.6	13.4	1.61
26 × 16	25.5	16.15	1.58
30 × 19	30	18.8	1.60
36 × 22	35.6	21.7	1.64
42 × 29	42.4	29.4	1.45

The steps in the series are such that the ratio of R_{dc}/L of two adjacent pot-cores is about 1.6.

ANNEX B

(Clause 4.0)

DERIVED STANDARDS

B-1 The primary standard given in the main text establishes values for the principal dimensions of core assemblies and wound coil-formers and enables full interchangeability for components complying with that standard to be achieved.

Parties interested in making or using pot-cores may find it desirable to lay down local standards for everyday use, which show the dimensions and tolerances in greater detail than 3, and which correspond to the state of the art in that area. These are known as derived standards. When doing so, care should be taken not to exclude any other type of pot-core meeting the primary standard, which would also satisfy the performance specification valid for a specific case.

It should be noted that whilst a component complying with a derived standard will comply with the requirements of 3 for the primary standard and therefore permit core assemblies and wound coil-formers to be freely interchanged, the parts thereof may not necessarily be interchangeable.

NOTE — For example, it may not be desirable or even possible for the adjuster intended to be used with cores complying with

one derived standard to be used with cores complying with another derived standard. This may be due to the tolerances on the central hole being significantly different in the two derived standards but both being within the limits of the primary standard.

When requirements would lead to the establishing of a departmental standard, the relevant departmental standardization body is strongly requested to insert a note in such a departmental standard that:

- i) it is in accordance with the dimensional requirements of this standard but that more details are given in order to promote its practical use; and
- ii) other solutions are possible within the framework of this standard and should not be excluded if the resulting cores and formers are functionally interchangeable with those according to the departmental standard.

By way of example, a possible derived standard for coil-formers is given in Table 7 and Table 8 read along with Fig. 3 and Fig. 4 respectively.

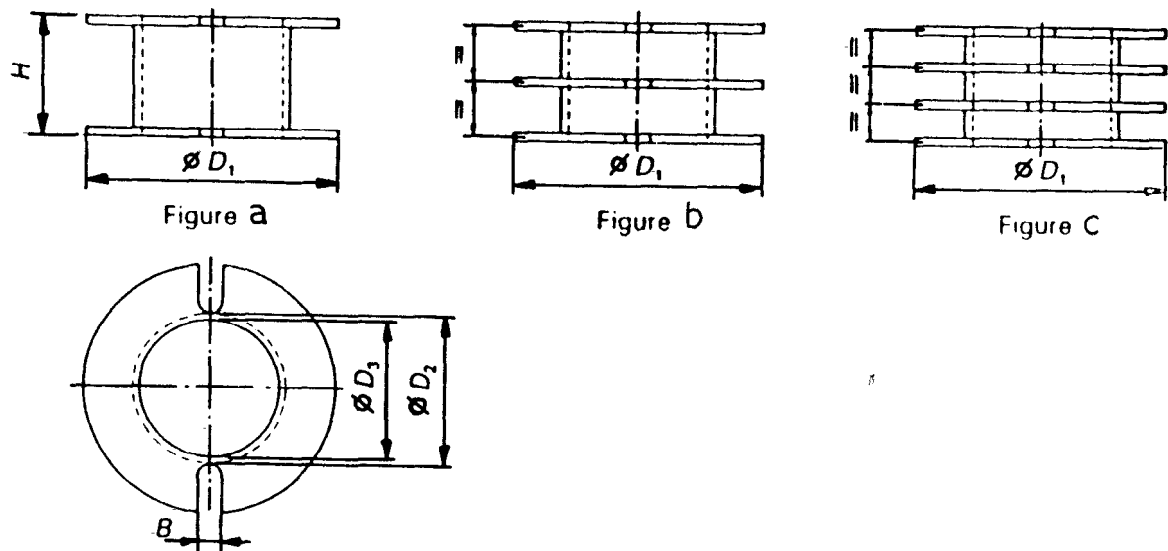


FIG. 3 DERIVED STANDARD FOR COIL-FORMERS

Table 7 Derived Standard for Coil-Formers — Main Dimensions
(Clause B-1)

Size	D_1		ϕD_2		ϕD_3		H		B	Units	Fig.
	Min	Max	Min	Max	Min	Max	Min	Max			
9 × 5	7.25	7.4	4.7	4.8	4.0	4.08	3.4	3.5	1.3	mm	3a
11 × 7	8.7	8.9	5.6	5.7	4.8	4.9	4.1	4.2	1.6	mm	3a
14 × 8	11.3	11.5	7.0	7.1	6.1	6.2	5.3	5.4	2	mm	3 a & b
18 × 11	14.6	14.8	8.6	8.7	7.7	7.8	6.9	7.0	2	mm	3 a, b & c
22 × 13	17.6	17.8	10.55	10.7	9.6	9.75	8.85	9.0	2.5	mm	3 a, b & c
26 × 16	20.7	20.9	12.65	12.8	11.7	11.85	10.65	10.8	2.5	mm	3 a, b & c
30 × 19	25.5	24.7	14.8	15.0	13.7	13.9	12.6	12.8	2.8	mm	3 a, b & c
36 × 22	29.4	29.6	17.7	17.9	16.5	16.7	14.2	14.4	2.8	mm	3 a, b & c
42 × 29	35.2	35.4	19.4	19.6	18.0	18.2	19.6	19.8	2.8	mm	3 a, b & c

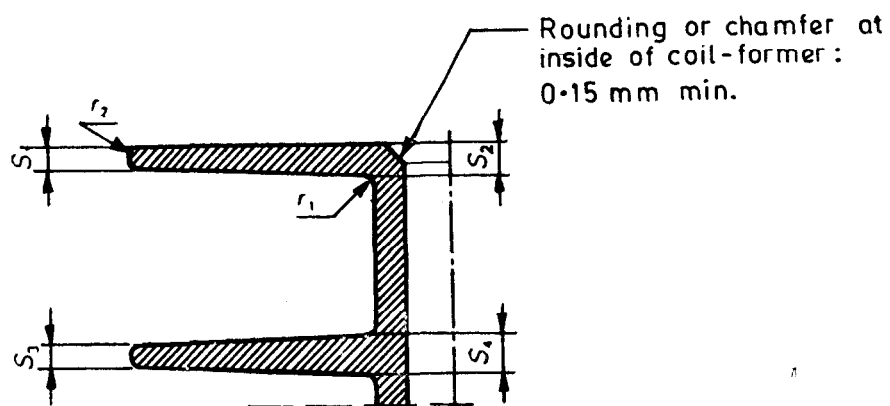


FIG. 4 FLANGE DETAILS

Table 8 Flange Dimensions
(Clause B-1)

All dimensions in millimetres.

Size	S_1		S_2		S_3		S_4		r_1	r_2
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
9 × 5	0.25	0.35	0.35	0.45	—	—	—	—	0.2	0.15
11 × 7	0.25	0.35	0.35	0.45	—	—	—	—	0.2	0.15
14 × 6	0.35	0.45	0.45	0.55	0.25	0.35	0.35	0.45	0.2	0.2
18 × 11	0.35	0.45	0.45	0.55	0.25	0.35	0.35	0.45	0.2	0.2
22 × 13	0.45	0.55	0.55	0.65	0.35	0.45	0.45	0.55	0.2	0.25
26 × 16	0.45	0.55	0.55	0.65	0.35	0.45	0.45	0.55	0.3	0.25
30 × 19	0.55	0.65	0.65	0.75	0.55	0.65	0.65	0.75	0.3	0.3
36 × 22	0.65	0.75	0.75	0.85	0.65	0.75	0.75	0.85	0.3	0.35
42 × 29	0.85	0.95	0.95	1.05	0.85	0.95	0.95	1.05	0.3	0.41

ANNEX C

(Table 2)

EXAMPLE OF A STANDARD FOR GAUGES TO CHECK THE DIMENSIONS OF
POT-CORES MEETING THE INDIAN PRIMARY STANDARD

C-1 GENERAL

The gauges shall be in accordance with Tables 9 and 10 read with Fig. 5 and Fig. 6 respectively.

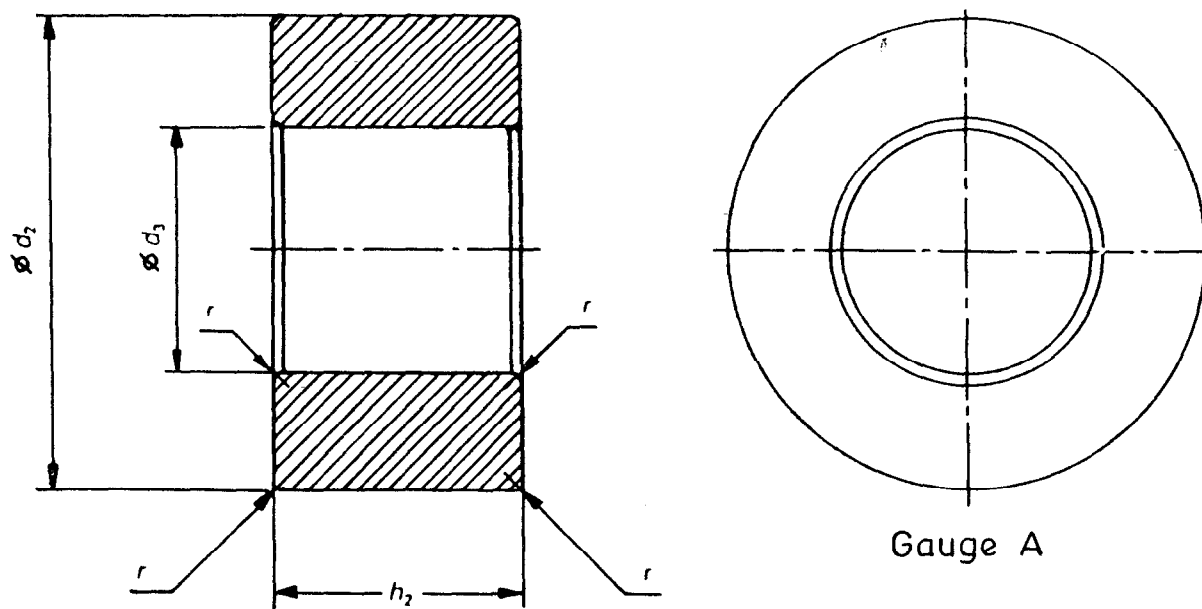


FIG. 5 GAUGE A

Table 9 Dimensions of Gauge A

(Clause C-1)

All dimensions in millimetres.

Size	ϕd_2			ϕd_3			h_2			r	
	Max	Min	Lim	Max	Min	Lim	Max	Min	Lim	Max	Min
9 × 5	7.495	7.480	7.459	3.917	3.905	3.953	3.595	3.583	3.565	0.35	0.25
11 × 7	8.995	8.980	8.959	4.717	4.705	4.735	4.395	4.383	4.365	0.35	0.25
14 × 8	11.595	11.577	11.554	6.017	6.005	6.035	5.595	5.583	5.565	0.35	0.25
18 × 11	14.895	14.877	14.854	7.620	7.605	7.640	7.195	7.180	7.160	0.35	0.25
22 × 13	17.895	17.877	17.854	9.420	9.405	9.440	9.195	9.180	9.160	0.45	0.35
26 × 16	21.195	21.174	21.149	11.523	11.505	11.546	10.995	10.977	10.954	0.45	0.35
30 × 19	24.995	24.974	24.949	13.523	13.505	13.546	12.995	12.977	12.954	0.45	0.35
36 × 22	29.895	29.874	29.849	16.223	16.205	16.246	14.595	14.577	14.554	0.45	0.35
42 × 29	35.595	35.570	35.503	17.723	17.705	17.746	20.295	20.274	20.249	0.5	0.4

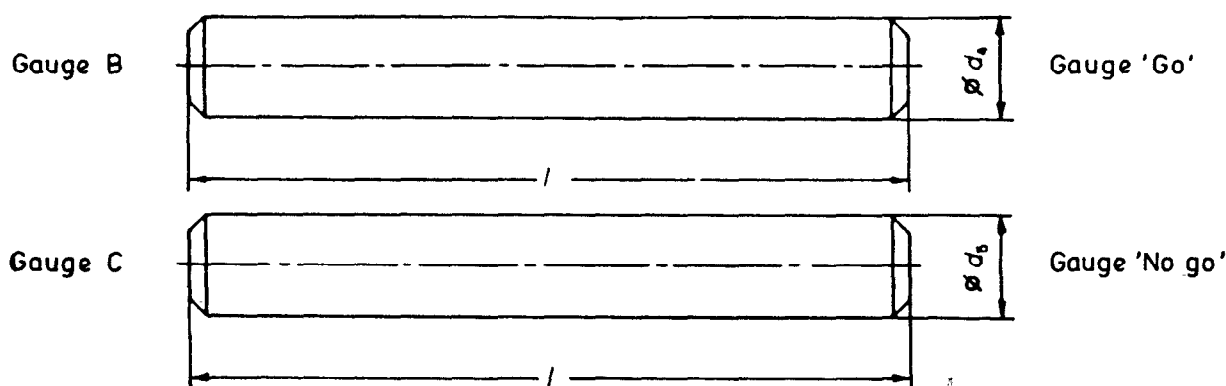


FIG. 6 GAUGES B AND C

Table 10 Dimensions of Gauges B and C

(Clause C-1)

All dimensions in millimetres.

Size*	<i>l</i>		ϕd_4			ϕd_5	
	<i>Max</i>	<i>Min</i>	<i>Max</i>	<i>Min</i>	<i>Lim</i>	<i>Max</i>	<i>Min</i>
9 × 5	20.5	19.5	1.995	1.986	1.971	2.014	2.205
11 × 7	20.5	19.5	1.995	1.986	1.971	2.214	2.205
14 × 8	20.5	19.5	2.995	2.985	2.971	3.214	3.205
18 × 11	20.5	19.5	2.995	2.985	2.971	3.214	3.205
22 × 13	20.5	19.5	4.395	4.383	4.365	4.617	4.605†
26 × 16	30.5	29.5	5.395	5.383	5.365	5.617	5.605†
30 × 19	30.5	29.5	5.395	5.383	5.365	5.617	5.605†
36 × 22	30.5	29.5	5.395	5.383	5.365	5.617	5.605†
42 × 29	40.5	39.5	5.395	5.380	5.360	5.617	5.605†

* Pot-cores without centre hole ($\phi d_4 = 0$) are not excluded. When closer tolerance on the centre hole diameter ϕd_4 is required, it should be obtained by reducing the maximum limit as follows:

9 × 5 and 11 × 7	2.1 mm
14 × 8 and 18 × 11	3.1 mm
22 × 13	4.6 mm
26 × 16, 30 × 19, 36 × 22 and 42 × 29	5.6 mm

† Sharp inner corners of pot-cores are preferable but in practice some rounding may occur provided that radius r_1 is not exceeded.

NOTES

1 The dimensions indicated as "Min" and "Max" give the manufacturing tolerance; that indicated as "Lim" gives the wear limit permissible for the gauges.

2 For some of these gauge diameters, the closer tolerance on the hole diameter, indicated in Note 1 to Table 1, has been taken into account.

C-2 PROCEDURE AND REQUIREMENTS

A pair of pot-core halves is placed around the appropriate gauge A. For cores with a centre hole, gauge B is inserted with gauge A still in position. These two core halves, when pressed together without forcing, shall meet at the outer ring without an air gap.

Gauge A shall not pass through the centre hole of either pot-core half.

Standard Mark

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